CLAIMS

Having thus described the preferred embodiments, the invention is now claimed to be:

1. A radio frequency coil **(30, 30', 30'', 120, 120')** for a magnetic resonance imaging system **(10, 10'')**, the radio frequency coil **(30, 30', 120, 120')** comprising:

a birdcage section **(34, 122, 122')** including a plurality of parallel spaced apart conductors **(46, 130, 130')** and one or more end conductors **(48, 132, 144', 154, 156)** aligned generally transverse to the spaced apart conductors **(46, 130, 130')**, the birdcage section **(34, 122, 122')** resonating at a birdcage resonant frequency; and

a TEM section **(32, 32', 32'', 124, 124')** including a plurality of parallel spaced apart conductors **(40, 40', 140)** and a radio frequency screen **(42, 142, 144, 144')**, the TEM section **(32, 32', 32'', 124, 124')** resonating at a TEM resonant frequency; wherein

the birdcage section **(34, 122, 122')** and the TEM section **(32, 32', 32'', 124, 124')** are relatively disposed with the parallel spaced apart conductors of each section aligned, the birdcage section **(34, 122, 122')** and the TEM section **(32, 32', 32'', 124, 124')** cooperatively defining a subject receiving region.

2. The radio frequency coil **(30, 30', 30'', 120, 120')** as set forth in claim 1, wherein the parallel spaced apart conductors **(46, 130, 130')** of the birdcage section **(34, 122, 122')** and the parallel spaced apart conductors **(40, 40', 140)** of the TEM section **(32, 32', 32'', 124, 124')** each include one or more electrically interconnected components selected from a group consisting of:

a linear printed copper trace on a printed circuit board,

a discrete capacitance, and

a conductive rod.

3. The radio frequency coil **(30, 30', 30'', 120, 120')** as set forth in claim 1, wherein the birdcage resonant frequency equals the TEM resonant frequency, the radio frequency coil **(30, 30', 120, 120')** further comprising:

couplings **(60, 62)** between the birdcage section **(34, 122, 122')** and the TEM section **(32, 32', 32'', 124, 124')**, the couplings **(60, 62)** cooperating with the birdcage section and the TEM section to define a volume resonator.

4. The radio frequency coil **(30, 30', 30'', 120, 120')** as set forth in claim **3**, wherein the couplings **(60, 62)** are selected from a group consisting of:

a radio frequency inductive transformer **(62)**,

a capacitive coupling **(60)**,

a coaxial half-wave cable, and

overlapping portions of the birdcage and TEM sections.

5. The radio frequency coil **(30, 30', 30'', 120, 120')** as set forth in claim **1**, further including:

couplings **(80, 82)** selectively arranged between selected spaced apart conductors of at least one of the birdcage section **(34, 122, 122')** and the TEM section **(32, 32', 32'', 124, 124')**; and

at least one radio frequency transmit/receive means **(84)** for selectively defining an array of resonators,.

6. The radio frequency coil **(30, 30', 30'', 120, 120')** as set forth in claim **5**, wherein the couplings include one of:

phase-shifting impedances arranged between selected spaced apart conductors, and

a decoupling impedance network **(80, 82)**.

7. The radio frequency coil **(30, 30', 30'', 120, 120')** as set forth in claim **5**, wherein the array of resonators define one of:

a phased array of coils, and

a SENSE coil array.

8. The radio frequency coil **(30, 30', 30'', 120, 120')** as set forth in claim **5**, wherein the couplings **(80, 82)** include active switching components **(84)** actively switched to effect the selective arrangement of the coupling/decoupling between selected parallel spaced apart conductors of at least one of the birdcage section **(34, 122, 122')** and the TEM section **(32, 32', 32'', 124, 124')**.

9. The radio frequency coil **(30, 30'', 120, 120')** as set forth in claim **1**, wherein:

the birdcage section (34, 122, 122') has an arcuate cross-section transverse to the parallel spaced apart conductors (46, 130, 130'); and

the TEM section (32, 32'', 124, 124') is substantially planar.

10. The radio frequency coil (30) as set forth in claim 1, further including:

a second birdcage section (34''') including a plurality of parallel spaced apart conductors (46''') and one or more cross conductors (48''') aligned generally transverse to the spaced apart conductors (46'''), the second birdcage coil (34''') resonating at a second birdcage resonant frequency, the second birdcage section (34''') being interchangeable with the birdcage section (34) such that the second birdcage section (34''') and the TEM section (32) are relatively disposed with the parallel spaced apart conductors of each section aligned, the second birdcage section (32''') and the TEM section (32) cooperatively defining the subject receiving region.

11. The radio frequency coil (120, 120') as set forth in claim 1, wherein the radio frequency screen (142, 144, 144') of the TEM section (124, 124') includes:

a first screen portion (142) disposed adjacent the parallel spaced apart conductors of the TEM section (120, 120'); and

an endcap screen portion (144, 144') transverse to the first screen portion (142) and transverse to the parallel spaced apart conductors (140) of the TEM section (120, 120').

12. The radio frequency coil (120') as set forth in claim 11, wherein the parallel spaced apart conductors (130') of the birdcage section (122') are capacitively coupled with the endcap screen portion (144') of the radio frequency screen (142, 144') of the TEM section (120').

13. The radio frequency coil (30'') as set forth in claim 1, wherein the radio frequency screen (22'', 24) includes:

a TEM screen portion (22'') coupled with the parallel spaced apart conductors (40) of the TEM section (32''); and

a shielding screen portion (24) connected with the TEM screen portion (22''), the shielding screen portion (24) extending around outside the birdcage section (34) and together with the TEM screen portion (22'') defining a shielding radio frequency screen inside of which

the birdcage section (34) and the conductors (40) of the TEM section (32'') are disposed.

14. A magnetic resonance imaging scanner (10, 10'') including:

a radio frequency coil (30, 30', 30'', 120, 120') as set forth in claim 1 encompassing the subject receiving region;

a magnet (14) which generates a temporally constant main magnetic field through the subject receiving region; and

a plurality of magnetic field gradient coils (16) arranged to produce magnetic field gradients across the main magnetic field in the subject receiving region.

15. The magnetic resonance imaging scanner (10, 10'') as set forth in claim 14, wherein the radio frequency coil (30, 30', 30'', 120, 120') is further arranged with the conductive rods (40, 40', 46, 130, 130', 140) of the birdcage and TEM sections generally parallel to the main magnetic field.

16. The magnetic resonance imaging scanner (10, 10'') as set forth in claim 14, further including:

a subject supporting bridge (26) having slots (56) inside of which at least some of the parallel spaced apart conductors (40) of the TEM section (32) are disposed.

17. The magnetic resonance imaging scanner (10) as set forth in claim 14, further including:

a shielding radio frequency screen (22, 24) disposed around the radio frequency coil (30, 30', 120, 120') and spaced apart therefrom.

18. The magnetic resonance imaging scanner (10, 10'') as set forth in claim 14, further including:

a second birdcage section (34''') including a plurality of parallel spaced apart conductors (46''') and one or more cross conductors (48''') aligned generally transverse to the spaced apart conductors (46'''), the second birdcage coil (34''') resonating at a second birdcage resonant frequency, the second birdcage section (34''') being swappable for the birdcage

section (34) of the radio frequency coil (30) such that the second birdcage section (34''') and the TEM section (32) are relatively disposed with the parallel spaced apart conductors of each section aligned, the second birdcage section (32''') and the TEM section (32) cooperatively defining the subject receiving region.

19. A radio frequency coil (150) comprising:

a birdcage section (152, 154, 156) including a plurality of parallel spaced apart conductors (152) and one or more cross conductors (154, 156) disposed generally transverse to the spaced apart conductors (152); and

a TEM radio frequency screen section (158, 160) including a radio frequency screen (158) coupled with the birdcage section (152, 154, 156) and having openings corresponding to spacings of the spaced apart conductors 152, and transparent or translucent dielectric material (160) disposed in the openings of the radio frequency screen (158), the transparent or translucent dielectric material (160) allowing an associated imaging subject disposed inside the coil (150) to see through the radio frequency coil (150).

20. The radio frequency coil (150) as set forth in claim 19, wherein the transparent or translucent dielectric material (160) is air.